



Streambank Stabilization for Long Term Success

Mark Pranckus

Senior Consultant

mark.pranckus@cardno.com

715-533-4228

February 26, 2020

Outline

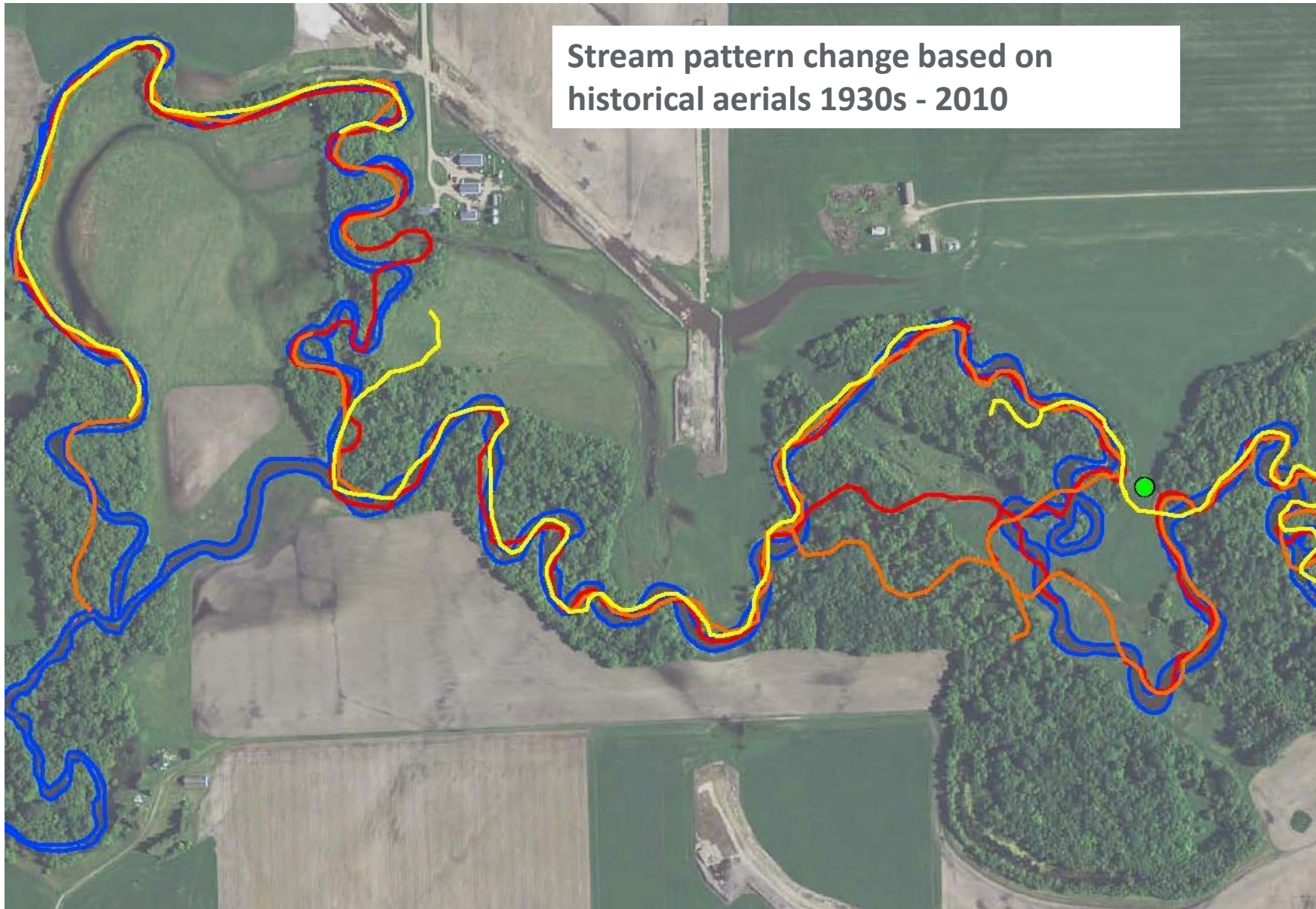
- > Bank erosion and project success
- > Examples of techniques to provide long term success
 - Special emphasis on high banks on outside bends
- > Discuss keys that support project success



Common Examples of Bank Erosion



Streams Move Over Time – Even Stable Ones



Bank Erosion that Gets Our Attention



Elements of Long Term Project Success



- > Remains relatively stable (To our temporal perception)
- > Minimizes impacts to infrastructure and potential for property damage.
- > Addresses larger needs such as water quality and habitat.
- > “Isn’t viewed as a constant problem”

Long Term Project Success: A Stream's Perspective

- > Maintain the ability to carry and transport sediment during low to bankfull flows
- > Access the floodplain to deposit sediment and lose energy
- > Have resilience to adapt to a changing climate, hydrologic regimes, and land use



Common Example Bank Erosion Problem – The High Outside Bank



The Cadillac of Solutions: Channel Re-alignment

> Pros

- Moves the stream channel away from an eroding bank.
- Uses/allows more access to a floodplain

> Cons

- Application may be limited due to:
 - Narrow valley – “Straighten channel”
 - Regulatory complexity
 - Landownership issues – Not appropriate floodplain is shared ownership.



Toewood with Soil Lift

> Pros

- Alternate to hard armoring
- Provides aquatic habitat for fish and aquatic organisms
- Doesn't require the channel to be re-aligned. Bankfull bench is key component.

> Cons

- Long term success requires proper construction AND
- Additional features such as glides, bank grading, and flow direction.



Stabilizing Eroding High Banks on Outside Bends

2015

2016

2019

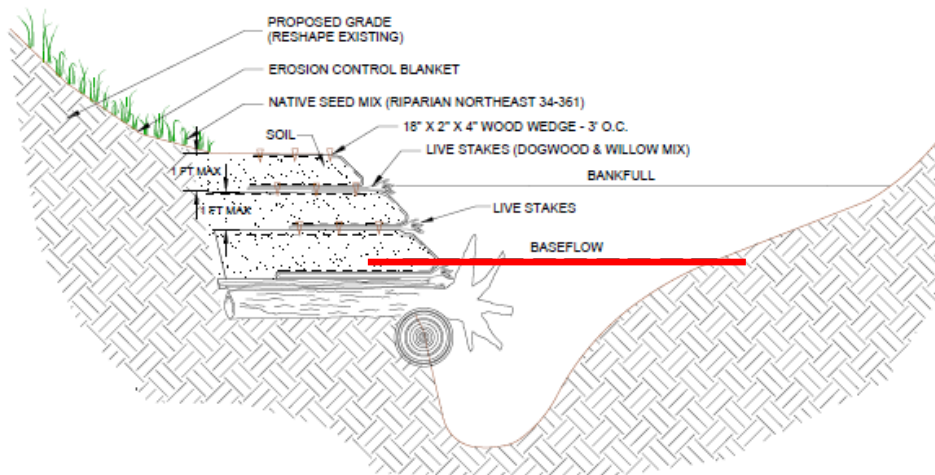


BEFORE

AFTER



Toewood with Soil Lift



Toewood with Soil Lift – Toewood Installation



- Modify rootwad spacing to leave bigger gaps between to leave additional habitat in low risk situations.
- Pack rootwads tight together if concerned – “Root Rap”

Why Rootwads Instead of a Stone Toe?

- > Reduce shear stress against the bank.
- > Provide helical flow and secondary circulation cells.
- > Scour out and maintain pool depth.
- > Provide excellent aquatic habitat.



Opportunity to Leverage Existing Resources and Activities

- > Rootwads generated from clearing and grubbing – Perfect balance for debris management
- > Project planning should consider off-site sources and T&E species.
- > Cost savings to project owners when material or source is provided.
- > Coordination among departments such as transportation and parks generating material as part of O&M programs.



Importance of a Bankfull or Floodplain Bench



- Allows flood flows to spread out and reduce energy before hitting eroding bank.
- “Landing place” to capture sediment and allow slumping back to come to stable angle of repose.

Woody Vegetation with Soil Lift – Long Term Stabilization Success



- Woody vegetation provides the long-term bank stabilization – Roots armor bank after ECB breaks down.
- Provides shade to cool the stream and reduce water temperature.
- Provides organic matter for aquatic insects, which is good for the fish.
- Adds resilience – Species that positively respond to a dynamic floodplain.

Other Factors that Influence Long Term Success – Bank Grading



- > Grade inside bend so that stream spills at bankfull elevation.
- > Reduce shear stress against outside bend.
- > Leave outside bend slightly higher, but have bench still accessible.

Missed Opportunity with Bank Grading?



- > Good floodplain bench
- > Inside bank remains higher.
- > More initial pressure on outside bend.
- > Let the inside bend be a depositional feature – Sign that it's working.

Other Factors that Influence Long-Term Success – Grade Control

Upstream – Vane to direct flow into the center of the channel.



Downstream – Glide structure to hold the pool elevation.



Toewood with Soil Lift - Putting it All Together



Eroding Banks Associated with Incised Channel

- > Results from downcutting due to increase storm volumes, channel modification.
- > Disconnects stream from floodplain or only reaches at more intense floods.
- > Typically results in erosion on both banks.



Raise Streambed Up to Connect to Floodplain – Re-alignment

> Pros

- Uses/allows more access to a floodplain
- Goes beyond stabilization into restoration

> Cons

- Application may be limited due to:
 - Narrow valley – “Straighten channel”
 - Regulatory complexity
 - Landownership issues – Not appropriate floodplain is shared ownership.
 - Cost



Re-establish Floodplain Bench at Lower Elevation

- > Bring the floodplain to the stream.
- > Reduce shear stress against banks.
- > Opportunity to change low flow channel dimensions to transport sediment.
- > Sediment deposition, nutrient reduction.



Floodplain Bench Creation – Example Miller Park – Duluth, MN

Before

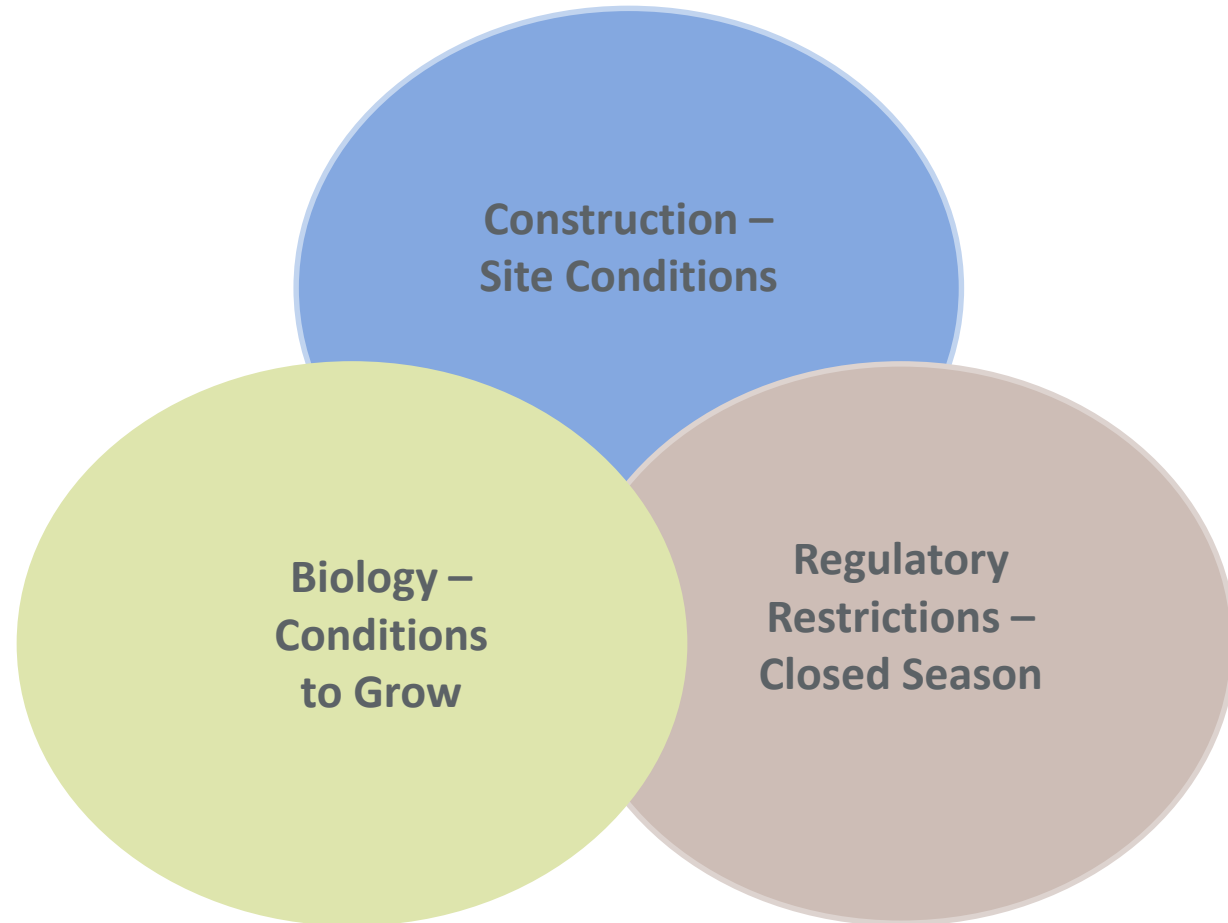


After



Long Term Stabilization Success – Native Vegetation Installation

- > Seasonal timing of project with best times to seed and plant.
- > Plan for when construction window, regulatory window, and biology window don't overlap.
- > Last step. Don't short change attention and effort. It isn't turf grass!
- > Successful project the vegetation is doing the long-term work.



Long Term Stabilization Success – Native Vegetation Ecological Services

- > Pollinator habitat.
- > Increase local plant diversity.
- > Enhanced aesthetics for public use.
- > Outdoor education and engagement.



Long Term Stabilization Success – Native Vegetation Establishment

- > Communication – Last person to know is the first person to mow.
- > Investment – Include 3 to 5 years of maintenance into the project budget.
 - Deer fencing
 - Overseeding
 - Invasive species control
- > Management – Native vegetation still needs attention – Mowing, burning, etc
 - Mirror natural process.
- > Context – Plan for high public use areas.



Long Term Stabilization Success – Adaptive Management

- > There will be a memorable storm following construction.
- > Be prepared to repair following significant storm events in the window after construction.
- > Structure angles and elevations may need to be tweaked.
- > Consider ways to maintain equipment access, but close out projects and/or permits.



Long Term Streambank Stabilization Success

- > Select practices that promote natural stream processes.
- > Implementation should focus not only on the eroding bank, but the opposite banks and floodplains.
- > Native vegetation is a key component to the long term success. Protect and manage that investment.
- > Stabilizing streams that maintain their natural-ness is a value to the community through improved ecological services and quality of life.

Thank you

For more information

Mark Pranckus
Senior Consultant

Mobile: 715-533-4228

Email: mark.pranckus@cardno.com

www.cardno.com